

Information-Driven Housing

How information can change the housing market
and drive sustainability through consumer demand.

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Abstract

While interest in sustainable residential development and construction has increased, aligning markets to these goals is highly challenging. Useful information available to consumers to inform their decision-making remains relatively limited. Consumers have not been led to a performance-based approach to evaluating and valuing housing to the degree they have been in other products' markets. This paper argues that all delivery agents – as well as the end-users – would greatly benefit from an improved set of evaluative tools to assess housing and context performance and quality with respect to a variety of factors that fit under the sustainability banner.

It provides an outline for such method, and explores the premise that, regardless of its inherent complexity, the housing industry can be successfully subjected to a consumer-driven information market model if effectively provided with a rational framework, appropriate metrics, and widespread validation. Adopting and promoting such a model bears enormous potential for housing – and consumers with it – to become an effective and significant agent for sustainability, while improving market transparency, reducing speculation and enhancing innovation and quality.

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1 Introduction

Radical transparency offers a way to unleash the latent potential of the free market to drive the changes we must make, by mobilizing consumers and executives to use data to make more virtuous decisions. An ecologically transparent marketplace lets each one of us become a far more effective agent of amelioration, giving shoppers a role as crucial as that of executives.¹

Over the last 50 years, the world has undergone change at an exponentially faster rate. In almost every area of life we have seen our models being constantly replaced. Thought, innovation, drive, and design have consistently shaped our society, our markets, and our culture, in a relentless pattern of progress. In a context of rapid evolution, the housing markets have often lagged behind, as the need for information increases faster than its availability, and the public is not as knowledgeable as in other less complex markets.

While interest in sustainable residential development and construction has increased, aligning markets to these goals is highly challenging. Useful information available to consumers to inform their decision-making – and to effectively assign relative value to housing and neighborhood context features that provide sustainability – remains relatively limited. It could be argued that amongst the biggest barriers to changing how homes are built, upgraded and retrofitted, is precisely this lack of information that results in the inability to adequately assign value to the wide array of features – design, materials, performance, community issues, amenities, etc. – that contribute to making a home and its surroundings more sustainable.

The Internet has provided a great platform for information and more and better housing and neighborhood information tools have become increasingly available. This information, however, is disseminated throughout the net and is often targeted at the savvier consumer, making it hard both to find useful data and to judiciously apply it to individual homes and communities. Furthermore, not all the required information is or will be available online, as relevant aspects of home construction and performance need onsite assessment and experts' analyses, audits, and reviews. Although potentially significant, conducting these kind of audits and reviews is not common practice.

Consumers have not been led to a performance-based approach to evaluating and valuing housing to the degree they have been in other products' markets such as automobiles, appliances, or electronics. The sheer heterogeneity of housing has made this difficult, as houses are not mass-produced, are highly customized, and the existing stock presents varying degrees of retrofits and modifications. Therefore, the cost of measuring performance doesn't necessarily entail economies of scale.

¹ **Ecological Intelligence**; Goleman, Daniel. 2009. Ecological Intelligence. New York, USA: Broadway Books. The Information Gap, Page 81.

This paper argues that policy makers, for-profit and non-profit housing providers, homeownership counselors, and especially the general public would greatly benefit from an improved set of evaluative tools to assess housing and context performance and quality with respect to a variety of factors that fit under the sustainability banner. It provides an outline of what such a method would look like, and is rooted in the premise that regardless of its inherent complexity, the housing industry can be successfully subjected to a consumer-driven information market model if effectively provided with a rational framework, appropriate metrics, and widespread validation.

Adopting and promoting such a model carries enormous potential for housing – and consumers with it – to become an effective and significant agent for sustainability, while improving market transparency, reducing speculation and enhancing innovation and quality.

2 **Housing Sustainability**

Sustainability is the capacity to endure. The concept has been used – and extensively misused – in the context of global warming, environmental issues, green technologies and renewable energy resources. For the purposes of this paper, however, sustainability refers to its primitive meaning, namely the “capacity to endure, the potential for long-term maintenance of well being, which in turn depends on the well being of the natural world and the responsible use of natural resources.”²

In the context of housing, applied sustainability principles are those that enable durability and stability, enhance overall efficiency both in building and in operations, minimize adverse environmental impacts and total carbon emissions, maximize homeowner’s utility, time, health and wellbeing, and intelligently integrates housing to a larger scale by providing infrastructure, services, connectivity and information. While a tall order, this is what consumers interested in sustainability often want, and what society as a whole is increasingly pursuing.

Housing quality should be conceived under a broad sustainability umbrella, and these notions need to be adequately conveyed to the housing delivery agents as well as to the end user. Both supply and demand have a significant role to play, by providing increasingly more sustainable products and by making increasingly better decisions, respectively.

If output and performance govern the car industry, overall sustainability – as defined above – must govern the housing realm. Sustainability is not only a possibility for housing but, rather, it should be a primary function of it. Housing has to meet the needs and aspirations of its dwellers, while fostering their alignment with environmental, social and economical constraints.

² **Wikipedia**; Sustainability.

3 Structural Issues

Housing units are enormously heterogeneous. They differ in numerous structural characteristics, in lot features, in the neighborhood, in local public services, and in accessibility to desired destinations. Occupants show by their behavior that differences in all these features are important. So housing is a package of many salient attributes, only some of which are under the control of the owner.³

Housing is highly heterogeneous and multidimensional. While a house stands for a lot of things – basic shelter, long-term investment, cash-flow generation and equity building, amongst others – for the end user it determines access to education and other municipal services, infrastructure, mobility and community values. It also determines or defines lifestyle, status, identity, place and what we ultimately call “home”. It also represents the most significant fixed cost of living for the vast majority of American families.

Housing derives its heterogeneity from the distinctiveness of every location, the variety of style, design, features, and technology, and the multiplicity of owners which ultimately accounts for different states of maintenance and upkeep. These are the primary dimensions of housing and consumers searching for homes must ascribe value to different units by aggregating these dimensions in what economists have called a hedonic approach for arriving at different values for the complete package. Economists have met, with considerable success, the need for modeling home prices or rents as a linear combination of certain basic observable features, most commonly size, style, age, number of floors, rooms, baths and bedrooms, specific finishes and some general proxies for context, neighborhood, and community attributes. This is a logical approach when what is being evaluated is not a single feature – like selecting different colors for identical cars – but rather a set of attributes where people assign values to multiple elements with a great degree of subjectivity, personal taste, or specific needs.

Though individual decisions about value are subjective and imprecise, the widespread use of hedonic models to account for variations in home values suggests that the hedonic theory of how consumers evaluate homes is not a bad approximation of reality and, what’s more, is a highly intuitive approach.

What is most interesting about the hedonic model is that it demonstrates that people mostly value what they can readily see, easily measure, and understand. After all, a rather small number of easily observable features turn out to explain an enormous amount of the variation in home values. This makes sense because many important

³ **The Maze of Urban Housing Markets: Theory, Evidence, and Policy**; Rothenberg, Jerome; Galster, George C.; Butler, Richard V.; Pitkin, John R. 1991. The Maze of Urban Housing Markets: Theory, Evidence, and Policy. Chicago, USA: The University of Chicago Press. Introduction, Page 2.

features of homes and their contexts, like energy performance or proximity to the onramp of a freeway, for example, are much harder to measure and assess. This suggests that the limitations of the current hedonic approximations come from the limitations for accounting for those less ‘visible’ attributes – namely energy efficiency, maintenance costs, material quality, access to transit, available infrastructure and others – in a way that makes sense to the end user.

Even the most experienced of consumers isn’t capable of assessing housing quality and value from a multidimensional perspective but, rather, is compelled to rely on an appraisal – based on comparable properties, namely *other* units – on the one hand, and the subjective value of the unit he or she *perceives*, on the other. The challenge lies in providing this information in a friendly and straight-forward manner that relates to the consumers’ interests and expectations.

Few people look at a house as a *product* and fewer still will expect information on its *performance*. Other than future resale value, people do not see housing as a good or service where varying levels of output and operating costs, in multiple layers or dimensions, could be accomplished. Instead we have consistently fed the prevailing paradigm where the cost of debt dictates *when* and the resale value dictates *what*, in an extremely simplified model for an extremely complex problem.

3.1 Partially Informed Choices

Lacking quality and performance metrics and parameters makes it very hard to assess, quantify, or weigh the value of homes. This results in appraisers and consumers relying mostly on easy to see, conclusive, hard information like size, total rooms, year of construction, mechanical systems, and visible finishes. Many other features and attributes remain unaccounted for, thus perception plays a significant role in decision making.

We *think* one house is better than the other one, but we have no mechanisms to measure “better”. We *believe* a certain neighborhood is better than the next but we don’t necessarily know what a better neighborhood means, let alone have the capacity or means to actually measure it. At most, this represents a partially informed choice.

This has led to the situation where, for any given subset, considering location and size, housing is pushed toward a commodity behavior where homogeneity is desired in a context where quality measures are absent. Consumers value and understand location, size, style, distribution and basic finishes; most of other potential qualities or enhanced performance remains unknown. Consumers understand that being close to a grocery store relates to less expenditure on fuel for their cars, or that having a modern furnace is safer and more efficient, but have no way of *really* knowing and therefore, will not make a decision based on these considerations. There is simply not enough information to make informed, rational choices.

3.2 Non-Performance Basis

Housing is not adequately assessed from a performance standpoint, nor are consumers as educated on what housing performance really means, as they are, for example, in the car industry. It is arguable that – for any given subset within the industry – cars are as good as they *can* be whereas houses aren't. The car industry has undergone constant and consistent evolution with performance, comfort and efficiency as its main objectives.

A modern car performs better, uses less resources, produces less waste, and is cheaper and more efficient than its obsolete counterpart. Cars are faster, safer, spend less fuel providing enhanced output, and their design features constantly exceed our expectations. They have become smarter – they park themselves, door locks engage automatically, lights go on when they need to, they warn of malfunctions – and have become easier to service, more reliable, and less expensive over time. Aside from energy performance of newer homes, it appears that the same degree of continuous improvement has not occurred in housing.

Cars are also multidimensional where consumers also make their decisions based on a hedonic index model, where they weigh specific attributes separately, and for many, they are also financed by a third party lender. The fundamental difference between these markets is that cars are viewed as performance machines and expected to perform accordingly. This conception leads to an information context with adequate indicators. When buying or renting homes, consumers know little of it and have to rely in a certain degree of projection or anticipation. When buying a car, however, consumers know exactly what they are buying in terms of quality, durability, safety, performance, resale price, amongst others aspects. It is well documented by the maker but also backed up by third party agents like Consumer Reports and others. What is more, consumers can learn from other consumers' opinions and experiences about exactly the same car used identical purposes.

Homes, by contrast, are not viewed or measured in terms of performance but under a much more subjective and personal light. When selecting a car, consumers *know* whereas when selecting a home, consumers *believe*.

3.3 Fragmentation of Supply

Housing supply represents a highly fragmented realm. In addition to the 120 million plus existing homes – with specific different characteristics, modifications, and improvements over time by their owners – decisions about new supply added at the margin are made by thousands of developers, contractors, subcontractors, designers,

engineers and consultants, all providing a wide array of different products that differ in location, size, style, and price, under hundreds of different sets of local rules, regulations and standards. This makes comparisons difficult and national standards few.

Fragmentation is inherent to the housing industry, and it is a greater virtue than it is a problem. Over time it has become clear that housing is better designed, built and managed when responsive to local conditions and driven by locally focused participants. Fragmentation is a reflection of the relative ease of entry into residential construction and of the diversity housing represents both physically and from the consumers' perspective.

In such a context of fragmentation, however, it makes sense to standardize measures of performance rather than products, namely performance and not type, output and not object, by providing meaningful and intelligent indicators in a comprehensive and holistic framework.

3.4 Financing Construction and Acquisition

As previously described, the traditional approach to construction and mortgage finance is defined by a commodity-like conception of housing. This discourages suppliers from making dramatic changes to homes and encourages them to stick with tried and true models and proven approaches. While functional, these strategies tend to limit innovation and change.

Traditional financing structures encourages minimizing costs at the beginning of development processes where uncertainties are greater, but also where significant potential for innovation, change and improvement lies. It therefore promotes effective marketing and sales expertise, that constitute *profit collection* at the end of the process rather than innovative designers, engineers, and other potential consultants, that constitute *additional cost* at the beginning.

In addition, minimizing costs at the beginning of development processes is key to meet competitive price points. Ironically, it also means that opportunities to amortize the costs of innovation and of operating cost savings – that could be achieved by these innovations – are often lost. Consumers are also often in a weak position to value such innovations as, without performance hard data, it is hard to anticipate these savings.

New and creative financial options are needed in order to align lenders goals with quality, sustainability, efficiency and innovation. In a context of imprecision, lack of comprehensive information, and non-performance oriented consumers, it is only natural that lenders will see change that adds to the cost of a home as related to increased risks.

When the consumer becomes a product ‘maker’ rather than a product ‘taker’ by becoming informed and expecting innovation, improvements and maximum utility for their dollar, suppliers will follow by providing the markets with a better product if the value of these improvements can be effectively demonstrated and are fully valued by consumers.

3.5 Information Issues

Ignorance cripples market efficiency, while sound data lets buyers make smarter choices. When sellers know something that consumer do not (...) the information inequity hampers market fairness and efficiency.⁴

Information asymmetry is one of the biggest issues responsible for slow evolution within the housing industry. Consumers make their choices based on limited available information and limited acquired knowledge. For many, buying a home is a once- or only twice-in-a-lifetime event and, as such, have no previous experience. Consumers are not as focused on the fact that housing is at once shelter, a support system, an enabler of services, and a depreciating asset, with performance output and associated operational costs.

In this context, suppliers have little incentives to explore for alternatives and solutions their own consumers will not appreciate and, therefore, will not value. Innovation represents risk for lenders, developers, and builders, as it generally results in increasing costs, complexity or need for specific knowhow.

The information available and managed by suppliers often does not translate into information the consumer can easily understand. A common language needs to be put in place if the housing industry is to become a consumer-driven market based on reliable, enhanced and validated information.

Knowing what a house can provide other than equity or shelter is key if the public is going to exert the necessary market pull to drive change. Change not only in how a house is conceived, financed and built, but how it is understood by the public. These outputs go far beyond the equity building capability and are easily equated to money, time, and other potential metrics of wellbeing.

⁴ **Ecological Intelligence**; Goleman, Daniel. 2009. Ecological Intelligence. New York, USA: Broadway Books. The New Math, Page 73.

4 Information Tools

While there have been quality and sustainability improvements on several fronts for new homes compared to older ones – energy efficiency, durability and/or quality of materials, basic safety features, etc. – overall changes within the housing industry have been evolutionary rather than revolutionary. The actual revolution in housing could come from web-based information sites and their ability to provide home buyers with more information and instruction than they have had before. Homebuilders could also help drive a revolution by finding ways to better market sustainability features in their homes and community locations in ways that may both resonate with demand for these features, and with what people are willing to pay to get them. This could create demand for similar information in the much larger market for existing homes.

In line with the wide-spreading trend of access to information for everyone, useful and interesting tools have come to light in recent years. Besides appraisals and inspection reports, information around housing has been greatly enhanced by a number of differently focused and targeted Internet housing information providers. These can be categorized into two major groups, the ones that are directly dealing with home sales and rentals, and the ones that aren't.

We have seen many of the big-market areas convert to an information-driven model – cars, homes, personal computers, and medical care are areas where nearly 4 in 5 shoppers say they gather information on their own from the Web before buying.⁵

Belonging in the first group are websites like Move.com or Realtor.com that have become a popular platform for posting units for rent and sale, respectively, under what tries to be a unified realtors' effort to centralize and standardize their universe of offerings, providing customers with a single more powerful tool. This tool has had significant impact given fragmentation and is certainly a step forward. However, information is not *fully* standardized and – while they offer traditional and basic information – the sites are biased towards deal-making and closings.

Also within the first group, there are popular websites for posting and finding homes, which are not restricted to real estate agents and brokers in terms of the information that gets posted. Such is the case with Zillow.com or Trulia.com where, much more in line with an *open* system, there is some space for interaction and feedback in order to make the information more precise, reliable and comprehensive. These sites – like the others – also link traditional information with other sets of data, like price trends, comparable sales, location demographics, and available schooling data, amongst others, going further in the effort of integrating several layers of available information. The result is a more transparent set of information and a more comprehensive approach to housing and services in location. They have become highly popular and

⁵ **Microtrends**; Penn, Mark J. 2009. Microtrends. New York, USA: Twelve. Lifestyles, Page 206.

claim several million views monthly. However innovative, though, the information is presented in a way that is still not easily understood by an average user, feedback is very limited and constrained, and information, although greater is not really translated into sensible consumer metrics.

Consumers are presented with a lot more information but still no full sense or real tools to make something of it. Only the savvier consumers are likely to be able to go beyond the basic info, equating it to meaningful hard facts. But it is of great importance to note that these sites are the ones setting the trends, growing in use and in line with what is happening in other, simpler markets. They take advantage of existing data by integrating it into their own, larger and specifically targeted set of information, like using maps from Google maps or school information from public agencies.

In the second group there are dozens of different powerful and data-abundant internet based tools. Some are purposely intended to serve the housing consumer and some are pieces of information and available knowledge that could easily be embedded or integrated into the housing business.

Directly related are some wonderful enlightening tools such as Walkscore.com which enables users to understand, in a quantifiable manner, the *walkability score* for any specific address within the US, or CityGoRound.com which provides information on all available internet applications regarding transit and transportation, biking, walking and driving, for a mobility-based approach. The Center for Neighborhood Technology (CNT) has developed the 'Housing + Transportation Affordability Index'⁶, an innovative tool that measures true affordability by calculating transportation costs of housing relative to location. ZoomProspector.com is yet another example of a website that, although primarily targeted at businesses, will link a specific address to a vast array of demographic data that could be a powerful tool for assessing neighborhoods' performance, trends, and projections, in an integrated housing approach.

These are just some examples amongst many other tools concerning planning, communities, energy, environment, education, leisure, finances, transportation, health, recreation, sports, and all those aspects that directly or indirectly link to housing and its service-enabling capabilities.

Public agencies control the largest share of data and information available to consumers and most of them make it available through their websites as well. DOE, DOT, HUD, the EPA, and the IRS are the key public actors with programs, data and knowledge dealing directly with sustainability, housing, community development, planning and neighborhoods.

What has been taking place is a consistent shift in trust from the provider of the information to the quality and reliability of the information itself. Openness and public

⁶ **H+T Affordability Index.** True affordability and Location Efficiency <http://www.htaindex.org/>

access to data, continuing feedback between the public and the providers of this information, and growing willingness to know and capacity to understand has paved a way could be defined as a informational democracy, where, vis-à-vis information and data, everyone is truly equal.

Information is compared, questioned, corrected and enhanced by this interaction and ability to share that the internet provides. Information is out there and is public, and therefore it is about sharing it rather than owning it.. This enables a certain degree of self-validation; a specific book is good because Amazon.com consumer ratings prove it rather than because it is written by a certain author or published by a renowned editor. In the more specific and technical arenas, however, validation needs to come from a an agent bearing the public's trust and recognition. This distinction is relevant as it defines two kinds of information – the one validated by the many amateurs and the one validated by the few experts – that comprise all these open modern information models.

The challenges lie not only in gathering and conveying information to consumers and producers but, most importantly, to do so in an effective manner that addresses the complexity of making people understand the things they cannot see. Only by transferring this knowledge first will a performance-based approach make any sense within the industry.

Attributes like energy efficiency and others that cannot be derived from looking at the floor plans can hardly be valued if they are not first understood and equated to consumer-friendly units. Lifespan of different materials, maintenance and replacement costs, or the derived value of living close to transit, for example, represent an even greater challenge. And even though many of these metrics and – other powerful information – is already available, there will not be significant market pull, trend-setting, or price-formation impact, until a critical mass within the market starts to focus on them.

5 Towards a Model.

Ignorance cripples market efficiency, while sound data lets buyers make smarter choices. When sellers know something that consumer do not (...) the information inequity hampers market fairness and efficiency.⁷

A consumer-driven market is achieved by spreading and enhancing information and understanding in those aspects that consumers care for, enabling consumers to create the necessary market pull to drive change in the direction of their preferences. For housing, the model for a consumer-driven market must integrate notions of housing performance with common consumer metrics of satisfaction. In other words, consumers must know that housing can provide varying degrees of performance in several levels and, then, how these performance values translate into common notions of utility, namely costs, time savings or other individual benefits.

In a choice-driven market, the consumers take the central role and become drivers of change. We have seen this happening consistently in consumer goods markets throughout, based on third party assessment, available information, and feedback from consumers.

Present contingency and context would make such efforts garner wide support. The energy and environmental crisis have set a context where more people are already thinking green, trying to save energy and reducing their overall footprint. The recent financial downturn calls for new approaches on homeownership, homebuilding, and home financing. Lastly, in the era of the 'information society', suppliers, consumers, and policy makers are familiar with information models, and grasp their incredible power for driving markets towards common goals.

Users have ample capabilities of creating market pull provided they have the necessary tools to do so. The internet has provided unthinkable power to enable information-driven markets, reduce speculation, and ultimately enhance quality in consumers' terms. High levels of engagement has been a direct consequence of the rise of information systems applied to other markets, and sets the field for a similar approach for housing. The perfectibility of the housing industry is as large as the possibilities to address it.

Consumers should shift to demanding performance information standards comparable to that of cars or many other products. The market should evolve into one where 'House&Garden®' mimics 'Car&Driver®', where output metrics are standardized, disclosed, validated and heavily utilized throughout the industry. While housing will remain a safe investment and equity-building asset, consumers should understand and train themselves to expect output, performance and services while they use the asset.

⁷ **Ecological Intelligence**; Goleman, Daniel. 2009. Ecological Intelligence. New York, USA: Broadway Books. The New Math, Page 73.

The key for a successful approach is being able to translate these metrics and indicators into consumer oriented units. Any model capable of effectively correlating housing performance to direct savings will have greater chances of success. Consider the mechanics behind an energy audit; for three hundred dollars, consumers may have an audit performed on their prospective homes. It is surprising that this has not become common practice, given it might show how one unit might have triple the energy costs of another over the year. Observing this could certainly lead to close or break a housing deal.

If consumers were to consider the various dimensions they could equate to money, namely utilities, maintenance costs, replacement cost and others, they could inform these savings to their equity building. And this is a key. If overall, a given unit could save the user two hundred dollars per month, he or she could save that money and, after a 30 year period – the same as the mortgage – at 5% they would end up with 150 thousand dollars in savings. This logic is not present enough in the housing markets today. Even less present are ways to assess and value time savings or minimizing environmental impacts or having greater or less expensive access to services?

Besides money, there are other simple straight forward units people relate to. As said, under the roof of sustainability, and by means of defining and establishing adequate econometrics, a whole new paradigm is at the verge of consolidating, one where a house is conceived as a service-providing good, with an equity-building dimension side by side to other similarly important dimensions.

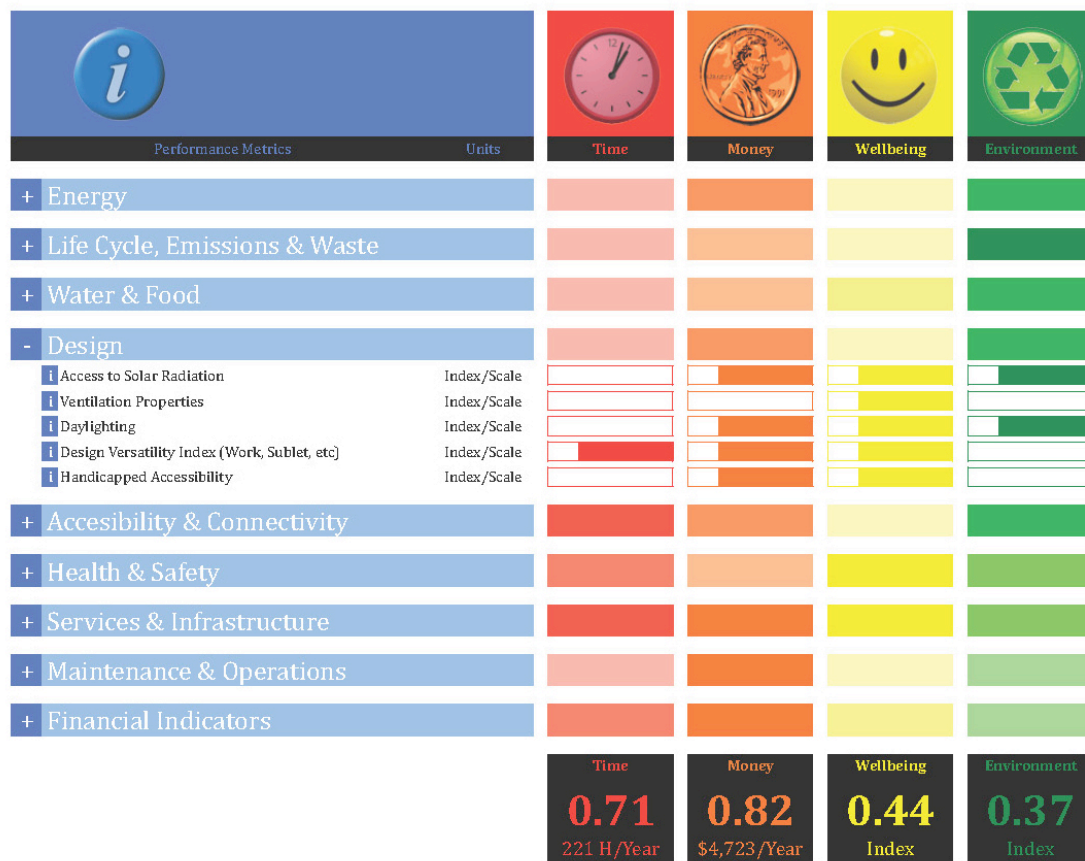
While this approach can come from a *validation* model or an *information* model, it is hard to conceive a multidimensional, dynamic and comprehensive validation system that would be fully sufficient, given the complexity and variety of aspects involved in a holistic housing quality approach. In a validation model, a validated third party certifies certain aspects and performance and issues a certificate. This is the case in programs like LEED® or Energy Star®, where the public confides in the institution behind an unbiased and professional certification. Understanding and knowledge is hence relayed to these certifiers.

The second model is one where increasingly educated consumers are able to discern reliable information that enables them to make an informed choice. Such is the case of the sales giant Amazon® where the available information, comparison tools, feedback integration, and rating tools, allow consumers to engage in what is considered to be an increasingly safe and informed decision-making process. It is also one in which performance information on particular units can be obtained from a range of reliable third-party sources, such as those certified to perform energy audits or similar assessments.

5.1 Model Design Criteria

A choice architect has the responsibility for organizing the context in which people make decisions.⁸

The framework proposed herein is one that effectively integrates performance to consumer utility measures under a powerful and user-friendly choice architecture. Available tools and information are highly atomized and serve a variety of different and specific agendas and objectives, where some address energy savings or walkability and others relate homes to transit or propose intelligent mortgages.



However provisional and speculative, this approach deals with housing in its multidimensionality and heterogeneity but drives towards enhanced performance information, improved user understanding, and the structuring of choice components all in one, providing a simple outcome that enables an informed decision and the possibility for several layers of understanding readily available to everyone in the market. It also integrates in one model the revolutionary idea of housing plus services as the only paradigm possible if housing is to enable sustainability and become an agent for smart growth and intelligent planning.

⁸ **Nudge**; Thaler, Richard H.; Sunstein, Cass R. 2008. Nudge. London, England: Penguin Books.

Although this is not intended as a functional model⁹, a first approach to an example of it under the proposed framework has been designed under the following criteria:

Overall Sustainability

Under an umbrella of overall sustainability as defined herein, namely the ability to endure, financially, socially, and environmentally, both at the unit and context levels. The framework hereby presented is aimed at providing choices and information under an overall pull towards sustainable growth.

Preferences

The model offers consumers with several categories and specific ratings for each one, not arriving at a single score. This accounts for choice, preference and dilutes biases, targeting different consumers who will weigh certain aspects over others depending on circumstances, tastes, and budgets. Proposed categories to structure measurement of sustainability while reflecting consumers' utility are Money, Time, Environment, and Wellbeing, where performance metrics inform one, several, or all categories, depending on their specific impact over them.

Distinct Information Sources

The performance and output attributes measured and weighed come from different type of sources. First, there is information already available and open, like Google® Maps or Walkscore®; secondly, there is information provided by a validated third party, like an energy auditor or a structural expert; finally, there's information provided by users, owners or bystanders, that provide opinion, feedback and other inputs. These three different approaches are all integrated into the model but should be treated accordingly. They also provide possibilities for different business models for delivering the information, with different design and implementation strategies.

Scalable Understanding

Consumers are presented at first with an index for each factor and category, allowing them to choose based on their own criteria and needs. However, all the information from which these ratings are derived is public and readily accessible, permitting anyone the opportunity to dig further into the information, deepening their understanding and fine-tuning their ultimate choices.

Scalable Depth & Fixed Width

If it is to be widely adopted and successful, the model requires a unique reading and universal approach for all consumers and all suppliers nationwide. Therefore, however scalable the model can be in terms of depth and thoroughness of measurements, metrics, and further enhancements and improvements in time, these will always utilize the same initial ranking system, allowing for evolution without losing continuity and recognition.

⁹ **DISCLAIMER:** The model, theoretical basis, and the intellectual property associated with all its parts is protected by United States Patent Law. "Patent Pending # US61/415,863" and is the property of Eduardo Berlin Razmilic. The examples presented herein are a simplification for explanatory purposes.

Powerful & Universal Choice Architecture

The choice architecture, namely what consumers read, has to be carefully designed to be clear, appealing, remembered and communicative, maximizing the chances for wide adoption and fast market penetration. The proposed first approach deals with this by providing color, clear wording, and simple, professional design.

Robust Measurement & Verification Protocols

Scalability, both in size and reach of the program as well as in its inherent complexity and depth, allows for a gradual enrichment of the model. However, from its very basic conception and evaluation methods, measurements need to be verifiable and reliable. The model itself allows for this incremental measurement of increasingly complex variables without losing robustness from the beginning.

5.2 Model Implementation Criteria

(...) A special kind of consumer has taken a major role in the marketplace – the New Info Shopper. These people just can't buy anything unless they first look it up online and get the lowdown.¹⁰

New Info Shoppers are bigger than a micro-trend. They represent a broad shift in the marketplace brought about by the Internet, higher education, and changing economic times. But the question is: When will the marketplace catch up to them?¹¹

Widespread adoption and quick and deep penetration is key for the success of this model and its ability to generate enough pull to significantly drive the housing market. The various efforts that should be made in order to maximize it's success, penetration and multilateral adoption are described as follows:

Support from Validated Entities & Programs

There are several federal agencies, as well as private for profit and nonprofit organizations that are on the same track. Green practices, efficient homes, high-quality standards, a renewed focus on user wellbeing, and enhanced information are all part of modern market paradigms. There are a lot of opportunities within these agents to take advantage from and help garner wide support and use of the proposed model. A consistent effort needs to be made to encourage integration of federal programs, available information managers, and a wide array of potential partners in several fields.

¹⁰ **Microtrends**; Penn, Mark J. 2009. Microtrends. New York, USA: Twelve. Lifestyles, Page 205.

¹¹ **Microtrends**; Penn, Mark J. 2009. Microtrends. New York, USA: Twelve. Lifestyles, Page 207.

Simultaneous Diffusion, Communication & Education Strategies

Creating market pull is all about the consumers demanding certain features and characteristics and suppliers providing them. Information asymmetry truncates adequate demand-driven evolution and therefore, this model needs to be instated with appropriate levels of marketing, communication as well as a certain degree of education on its particular approach in general, and the varying levels of performance that are being evaluated. While relying strongly in a straightforward and strong choice architecture, it is also key to partner with federal, state, and local agents and home advisors in order to effectively communicate what housing sustainability and housing quality is all about.

Transparency

Accessibility, clarity and transparency are extremely important in any validation model. In this case this is particularly true, as the model aims to subject a whole market to a single rating mechanism. Not only the ulterior goals behind this model needs to abide by these principles but the whole participation, partnering and measuring systems as well. The model needs to be open, public and its procedures clearly defined and informed. Anyone should be able to navigate through it as deep as desired and participation should be entirely open and available for the best providers.

Partnering with Supply Agents

Builders, brokers, and real estate professionals are all potential partners for making the model work. In spite of its consumer-driven approach, suppliers need to buy into the model in order to effectively create a common language between supply and demand. Housing performance must become an appealing approach for suppliers, while the model enables them to provide end users with proof of quality and validation of output. Real estate agents and brokers need to see these tools as an enhancer of their ability to evaluate projects and provide their clients with better information and targeted solutions.

Viable & Attractive Business Models for Information Providers

All three information provider types – existing providers of available data, validated third parties, and bystanders – need to be considered and offered fair, attractive and engaging possibilities. The model relies on its ability to unify, standardize, weigh and sort great amounts of data that is necessarily provided by external agents. Only by capturing both for those looking for business opportunities as well as those looking to participate for different reasons, the model has greater chances of success and real, significant impact.

Standardize Output instead of Features

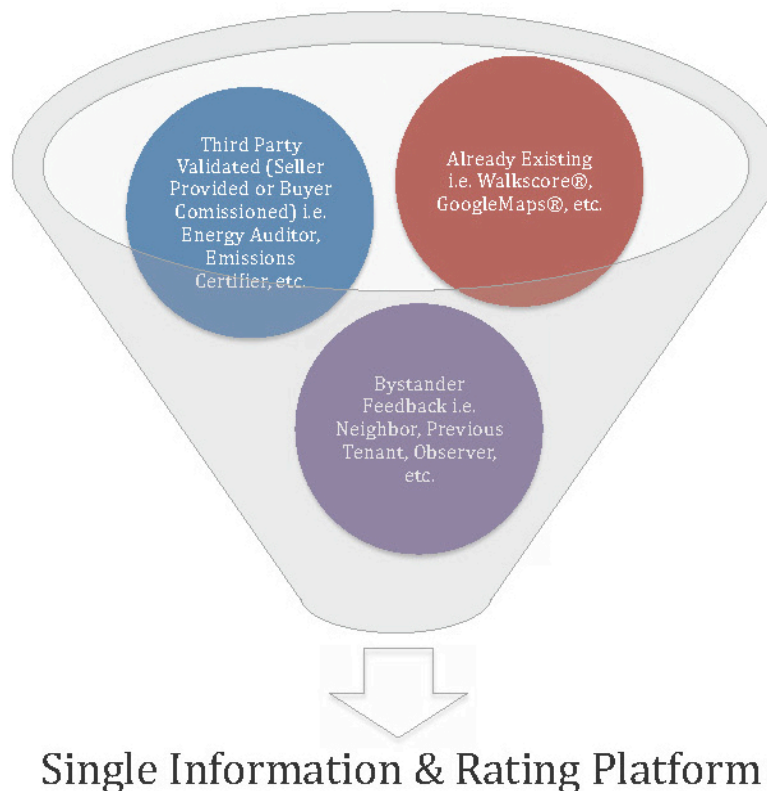
Fragmentation of supply comes along with an even greater fragmentation of specific features, technologies used, materials, design approaches, and the infinite combinations possible. Housing is an open, free market and it involves thousands of suppliers with different value propositions. This is certainly a virtue as it allows for healthy competition and it accounts for both the heterogeneity of the product and of the end user. Benchmarking and standardization, therefore, has to be focused on

output rather than features or characteristics. It needs not to be about a technology choice or a specific's manufacturer product but only about their measurable – and subject to validation – output. The idea is not to limit competition but, rather, to encourage all competitors to achieve their best possible outcomes.

Underlining of Integrated Building Plus Context Approach

A housing unit should not be evaluated independently from its context, as both dimensions are inherently attached and, by taking them apart, important distortions arise. Furthermore, context needs to inform the unit and vice versa, to achieve intelligent results in line with greater goals and objectives as, for example, efficiency on context can lead to inefficiencies on a unit. Only by underlining the notion of housing plus context – what HUD has dubbed “Housing plus Services” – will this model push for significant change and attain large scale impact. All things exogenous to the unit fall under this notion of context, namely services, infrastructure, environmental conditions, connectivity and demographics. Both consumers and delivery agents need to understand the real impact of contextual circumstances in housing and leverage their ability to make increasingly better decisions under this light.

Information Sources



6 Potentials & Reach – Driving Change

The foreseen potential of a holistic approach as proposed in this paper is huge, as it would successfully – if properly designed and marketed – engage the public and suppliers in a scalable measurement system, open to all agents. The goal is to drive this market from the actual marketing and advertising-driven model to a consumer-driven model based on information, intelligently conceived and designed, widely conveyed, and providing a transparent, comprehensive, and validated set of performance and output metrics. Success lies in setting the proper grounds for information to take over and, what behavioral economy calls ‘choice architecture’ to negotiate successfully between the policy, the industry and the consumers agendas. The most significant aspects of embedded potential can be described as follows:

Becoming a Sustainability Agent

By effectively equating environmental, social, and economical sustainability principles with measures and categories of evaluation consumers are familiar with and appreciate, the model stands as a passive and non-biased sustainable practices driver. This approach is key if the housing stock – and its enormous impact on the environment, resources, energy demand, social context and economic reality – is to successfully and smoothly adapt to the challenges of our times.

Enabling Consumers with Informed Choices

The first and primary goal is providing information for consumers thus enabling them with informed decision-making. This is the instrumental for providing them with maximized levels of utility or satisfaction on their choices, but also for better understanding of the potential and significance of a particular housing choice, enabling consumers with the ability to maximize output in all dimensions.

Becoming a Modeling Tool for Delivery Agents

Builders, landlords and other delivery agents will be able to effectively measure their products output and deliver their results to users. Most importantly, both existing owners as well as suppliers of new stock, will be able to model their results and adapt their design and location decisions aiming at higher outputs for equivalent inputs. In this sense information can enable further and better understanding as to *what* and *where* to build.

Directing Mission-Driven Non-Profit Organizations

Third party agents can tailor their needs by modeling their products to align to their goals and mission. A great deal of information that bears on the suitability of housing from a variety of perspectives like walkability, affordability index, access to support programs and grants, etc., should inform their decision-making in regards to location and desired context features. The ability to anticipate and enhance performance and, therefore, units’ efficiency, associated costs, and ease of operations is key for supporting affordability efforts. These tools, amongst others, enable non-profit organizations and home-counseling parties to help their customer-base meet their expectations and enhance their possibilities.

Transferring Validated Cost-Effective Measures to Consumers

By participating in the program, any developer, landlord, or homeowner can effectively transfer the cost of any cost-effective measure to the next buyer, or renter. This enables greater implementation of cost-effective betterments but, most importantly, allows for enhanced competition on validated features, quality and performance outputs amongst all players.

Integrating Cost-Effective Measures to the Lending Structures

Lenders can buy into the program by adapting their lending structures to foster better, more efficient, less risky products, given the validation model assures output and performance. This represents a virtuous cycle and a shift from a standard appraisal exercise to a more comprehensive modeling. Lenders will see a real and possibility for driving their real estate lending portfolios towards those that present enhanced information and improved quality standards.

Informing Planning & Zoning Decision Making

By modeling results at an urban and suburban scale, this tool has the potential of informing policy makers and local regulators on planning and zoning. By integrating available data into a simple tool that will account for bottom line housing potential, involved agents can enhance their decision-making and align their goals to a feasible and robust growth model.

Increasing Competition

Transparent information, wide participation, and a common language for all players, are the key ingredients this model is made of. In a market with significant degrees of risk and uncertainty, this 'big program' proposal would have an equalizing effect by nature, decreasing overall speculation, driving competition, and potentially reducing inherent risks.

The points described above account for the extensive potential and reach of the proposed model. Given the amount of dispersed ideas, tools, and data available it is clear that information is not missing, or that at least the capacity to generate it is there. What is truly needed is a smart vehicle to convey it in a manner that makes sense, is adequate for consumers, fair for providers, good for business, sustainable, affordable and perfectible in time.

As has been the case with the car industry, the electronics and appliance industries, or even the restaurant industries, where information in many forms is widely available and presented in a consumer-friendly manner, the housing industry can embark in a similar journey. Not only will consumers and society as a whole benefit from a faster pace evolution, reduced speculation within the market, diminished information asymmetry, and ultimately a better quality product, but it is a plausible and powerful instrument for integrating sustainability practices at every level, from the consumers and producers up, instead of from policy makers and regulators down.

7 Conclusions

A consumer-driven choice model based on information, transparency and interaction can be adopted, successfully implemented, and bears enormous potential for leading the housing industry in a path of consistent sustainability, affordability, innovation and quality. Understanding choices will not only help drive change within the built environment but will also drive change in behavior, particularly important in the context of sustainability.

All the necessary information, tools and data is already available for crystallizing this proposal. It is necessary to design a powerful, intelligent, and comprehensive framework, with smart and meaningful choice architecture – by means of private, public and/or third sector collaboration – and the consistent policy initiatives to educate, inform and train the consumers.

In the short term, if successful and widespread, the model has the potential of quickly creating necessary market pull to drive the housing market into unseen patterns of dynamism, evolution and development. In the short term we can expect enhanced tools for smarter choices under equal conditions, the ability to compare and the gradual obsolescence of information asymmetry.

Just like the car industry, houses could become as good as possible by virtue of transparency, innovation, information, and choice. In the long term, it will promote a highly dynamic market with top quality housing in far richer contexts, and the ability for planners, developers, designers, lenders, and policy makers to work in an arena of data, information, a finer granularity, and a higher degree of certainty. It is hard to foresee exactly how houses and neighborhoods will transform and how much better they will perform, and in what ways; but it is safe to assume a virtuous circle towards a better market, where higher dynamism, healthier competition, consumers' choice, industry transparency, and enhanced information all add up to a consistent contribution to the sustainable future of our housing stock.

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